

**What is claimed is:**

1. A method of designing a dietary and/or a pharmaceutical regimen for a human or a veterinary animal comprising

5 (i) determining *ex vivo* a baseline cytokine level in a body sample of the human or the veterinary animal, wherein the cytokine is associated with an inflammatory and/or immunomodulating pathway; and

(ii) designing, based on the baseline cytokine level, a pharmaceutical and/or dietary regimen to promote homeostatic cytokine levels in the human or the veterinary

10 animal, wherein the pharmaceutical and/or dietary regimen comprises administration of a flavanol and/or a procyanidin oligomer and/or a derivative thereof.

2. A method of designing a dietary and/or a pharmaceutical regimen for a human or a veterinary animal comprising:

(i) determining *ex vivo* a baseline cytokine level in a body sample of the human or 15 the veterinary animal, wherein the cytokine is associated with an inflammatory and/or immunomodulating pathway;

(ii) diagnosing, based on the baseline cytokine level, whether the human or the veterinary animal is at risk of, or suffers from, a condition associated with inflammatory and/or immunomodulating pathways; and

20 (iii) designing a pharmaceutical and/or dietary regimen effective for prophylactic or therapeutic treatment of the condition diagnosed in step (ii).

3. The method of claim 2, wherein the pharmaceutical and/or dietary regimen comprises administration of a flavanol and/or a procyanidin oligomer and/or a derivative thereof.

25 4. The method of claim 2, wherein the condition is cardiovascular disease, coronary heart disease, cardiac fibrosis, atherosclerosis, and/or renal disease or failure.

5. A method of designing a dietary and/or a pharmaceutical regimen for a human or a veterinary animal comprising

(i) determining *ex vivo* a baseline cytokine level in a body sample of the human or 30 the veterinary animal, wherein the cytokine is associated with an inflammatory and/or immunomodulating pathway;

(ii) incubating the body sample with a series of flavanols and procyanidins, and/or derivatives thereof, or a mixture thereof, under conditions sufficient to induce a change in cytokine levels and measuring the resulting cytokine levels;

5 (iii) comparing the baseline cytokine level with the cytokine levels obtained in step (ii) to determine cytokine responsiveness of the human or the veterinary animal to flavanols and procyanidins;

(iv) designing, based on the cytokine responsiveness, a pharmaceutical and/or dietary regimen to promote homeostatic cytokine levels in the human or the veterinary animal, wherein the pharmaceutical and/or dietary regimen comprises administration of a

10 flavanol and/or a procyanidin oligomer and/or a derivative thereof, or a mixture thereof.

6. A method of designing a dietary and/or a pharmaceutical regimen for a human or a veterinary animal comprising

(i) determining *ex vivo* a baseline cytokine level in a body sample of the human or the veterinary animal, wherein the cytokine is associated with an inflammatory and/or

15 immunomodulating pathway;

(ii) incubating the body sample with a series of flavanols and procyanidins and/or derivatives thereof, or a mixture thereof, under conditions sufficient to induce a change in cytokine levels and measuring the resulting cytokine levels;

(iii) comparing the baseline cytokine level with the cytokine levels obtained in

20 step (ii) to determine cytokine responsiveness of the human or the veterinary animal to flavanols and procyanidins;

(iv) diagnosing, based on the cytokine responsiveness, whether the human or the veterinary animal is at risk of, or suffers from, a condition associated with inflammatory and/or immunomodulating pathways; and

25 (v) designing a pharmaceutical and/or dietary regimen effective for prophylactic or therapeutic treatment of the condition diagnosed in step (iv).

7. The method of claim 6, wherein the pharmaceutical and/or dietary regimen comprises administration of a flavanol and/or a procyanidin oligomer and/or a derivative thereof.

30 8. The method of claim 6, wherein the condition is cardiovascular disease, coronary heart disease, cardiac fibrosis, atherosclerosis, and/or renal disease or failure.

9. A method of prophylactic or therapeutic treatment of a human or a veterinary animal comprising:
  - (i) determining *ex vivo* a baseline cytokine level in a body sample of the human or the veterinary animal, wherein the cytokine is associated with an inflammatory and/or immunomodulating pathway;
  - (ii) designing, based on the baseline cytokine level, a pharmaceutical and/or dietary regimen to promote homeostatic cytokine levels in the human or the veterinary animal; wherein the pharmaceutical and/or dietary regimen comprises administration of a flavanol and/or a procyanidin oligomer; and
- 10 (iii) administering a flavanol and/or a procyanidin oligomer and/or a derivative thereof to the human or the veterinary animal according to the pharmaceutical and/or dietary regimen designed in step (ii).
10. A method of prophylactic or therapeutic treatment of a human or a veterinary animal comprising:
  - (i) determining *ex vivo* a baseline cytokine level in a body sample of the human or the veterinary animal, wherein the cytokine is associated with an inflammatory and/or immunomodulating pathway;
  - (ii) diagnosing, based on the baseline cytokine level, whether the human or the veterinary animal is at risk of, or suffers from, a condition associated with inflammatory and/or immunomodulating pathways;
  - (iii) designing a pharmaceutical and/or dietary regimen effective for prophylactic or therapeutic treatment of the condition diagnosed in step (ii); and
  - (iv) treating the human or the veterinary animal according to the pharmaceutical and/or dietary regimen designed in step (iii).
- 25 11. The method of claim 10, wherein the pharmaceutical and/or dietary regimen comprises administration of a flavanol and/or a procyanidin oligomer and/or a derivative thereof.
12. The method of claim 10, wherein the condition is cardiovascular disease, coronary heart disease, cardiac fibrosis, atherosclerosis, and/or renal disease or failure.

13. A method of prophylactic or therapeutic treatment of a human or a veterinary animal comprising:

(i) determining *ex vivo* a baseline cytokine level in a body sample of the human or the veterinary animal, wherein the cytokine is associated with an inflammatory and/or immunomodulating pathway;

5 (ii) incubating the body sample with a series of flavanols and procyanidins and/or derivatives thereof, or a mixture thereof, under conditions sufficient to induce a change in cytokine levels, and measuring the resulting cytokine levels;

(iii) comparing the baseline cytokine level with the cytokine levels obtained in step (ii) to determine cytokine responsiveness of the human or the veterinary animal to flavanols and procyanidins and/or derivatives thereof;

10 (iv) designing, based on the cytokine responsiveness, a pharmaceutical and/or dietary regimen to promote homeostatic cytokine levels in the human or the veterinary animal; wherein the pharmaceutical and/or dietary regimen comprises administration of a flavanol and/or a procyanidin oligomer and/or a derivative thereof; and

15 (v) administering a flavanol and/or a procyanidin oligomer and/or a derivative thereof, or a mixture thereof, to the human or the veterinary animal according to the pharmaceutical and/or dietary regimen designed in step (iv).

14. A method of prophylactic or therapeutic treatment of a human or a veterinary animal comprising:

20 (i) determining *ex vivo* a baseline cytokine level in a body sample of the human or the veterinary animal, wherein the cytokine is associated with an inflammatory and/or immunomodulating pathway;

(ii) incubating the body sample with a series of flavanols and procyanidins and/or derivatives thereof, or a mixture thereof, under conditions sufficient to induce a change in cytokine levels, and measuring the resulting cytokine levels;

25 (iii) comparing the baseline cytokine level with the cytokine levels obtained in step (ii) to determine cytokine responsiveness of the human or the veterinary animal to flavanols and procyanidins and/or derivatives thereof;

(iv) diagnosing, based on the baseline cytokine level, whether the human or the veterinary animal is at risk of, or suffers from, a condition associated with inflammatory and/or immunomodulating pathways;

5 (v) designing a pharmaceutical and/or dietary regimen effective for prophylactic or therapeutic treatment of the condition diagnosed in step (iv); and

(vi) treating the human or the veterinary animal according to the pharmaceutical and/or dietary regimen designed in step (v).

10 15. The method of claim 14, wherein the pharmaceutical and/or dietary regimen comprises administration of a flavanol and/or a procyanidin oligomer and/or a derivative thereof.

16. The method of claim 14, wherein the condition is cardiovascular disease, coronary heart disease, cardiac fibrosis, atherosclerosis, and/or renal disease or failure.

17. The method of claims 1, 2, 5, 6, 9, 10, 13 or 14, wherein the cytokine is TGF- $\beta$ .

15 18. The method of claims 1, 2, 5, 6, 9, 10, 13 or 14, wherein the cytokine is TGF- $\beta 1$ .

19. A screening assay for identifying cytokine responsiveness of a human or a veterinary animal comprising: (i) determining *ex vivo* a baseline cytokine level in a body sample of a human or a veterinary animal, wherein the cytokine is associated with an inflammatory and/or immunomodulating pathway; and (ii)

20 incubating the body sample with a series of flavanols and procyanidins and/or derivatives thereof, or a mixture thereof, under conditions sufficient to induce a change in cytokine levels, and measuring the resulting cytokine levels.

20. The screening assay of claim 19, further comprising comparing the baseline cytokine level with the cytokine levels obtained in step (ii) to determine cytokine responsiveness of the human or the veterinary animal to flavanols and procyanidins and/or derivatives thereof.

25 21. The screening assay of claim 20, further comprising diagnosing the human or a veterinary animal as being at risk of, or suffering from, cardiovascular disease, coronary heart disease, cardiac fibrosis, atherosclerosis or renal disease or failure.

30 22. A method of determining a therapeutic value of a polyphenol for modulating cytokine levels in a mammal, the method comprising:

- (i) obtaining body samples from at least one low cytokine producer and at least one high cytokine producer;
- (ii) determining baseline cytokine levels in the body samples;
- (iii) incubating the body samples with a polyphenol not known to have cytokine modulation properties under conditions sufficient to induce a change in cytokine levels;
- (iv) determining the cytokine levels after the incubation of step (iii); and
- (v) comparing the baseline cytokine levels with the cytokine levels of step (iv) to determine whether the polyphenol has cytokine modulating properties.

5 23. The method of claim 22, wherein the mammal is a human.

10 24. The method of claim 22, wherein the mammal is a veterinary animal.

25. A method of treating a subject, which is a low baseline TGF- $\beta$  producer, comprising administering to the subject at least one flavanol and/or procyanidin oligomer selected from the group consisting of monomer, dimer, trimer, tetramer

15 and pentamer, or any mixture or derivative thereof, in the amount effective to stimulate the level of TGF- $\beta$  in the subject, wherein the subject is a human or a veterinary animal.

26. The method of claim 25, wherein TGF- $\beta$  is TGF- $\beta$ 1.

27. A method of treating a subject, which is a high baseline TGF- $\beta$  producer, comprising administering to the subject at least one procyanidin oligomer 6-10, or any mixture or derivative thereof, in the amount effective to stimulate the level of TGF- $\beta$  in the subject, wherein the subject is a human or a veterinary animal.

20 28. The method of claim 27, wherein TGF- $\beta$  is TGF- $\beta$ 1.